EHS–International, Inc.

February 1, 2011

Mr. Mark Adams
Site Manager
State of Washington Department of Ecology
Voluntary Cleanup Program
3190 160th Avenue SE
Bellevue, Washington 980084-5452

Re: Discovered Environmental Liabilities Federal Center South property.

Dear Mr. Adams:

The US General Services Administration (GSA) is erecting a new building within the northwest portion of the Federal Center South property. During site preparation work new chemical impacts to property soil and groundwater have been discovered.

This document and included back-up reports were prepared to present to the Washington State Department of Ecology (Ecology) the extent of discovered environmental liability and the interim remedial actions carried out to mitigate the liability.

Federal Center South Interim Soil Remediation and Site Assessment

A summary of the Interim Soil Remediation and Site Assessment (EHSI 2010) is presented below. A copy of the Final Report is submitted with this letter.

GSA retained EHSI to conduct an Interim Soil Remediation and Site Assessment of a portion of the Federal Center South property, located at 4735 East Marginal Way South in Seattle, Washington 98134. The Interim Soil Remediation and Site Assessment took place within an asphalt-paved parking lot located west of the Federal Center South Building 1202 and immediately east of the Duwamish Waterway. Portions of Building 1202 are currently being demolished for construction of a new office building. This report summarizes field activities and observations, analytical results, and contaminated soil disposal documentation for the Federal Center South Interim Soil Remediation and Site Assessment.

The purpose of the Federal Center South Interim Soil Remediation and Site Assessment was to remove and dispose of chemically-impacted soils from four areas and to assess potentially contaminated areas across the Building 1202 parking lot and its environs. The areas of suspected contamination were identified during a recent geotechnical investigation and previous site investigations conducted on-site. The four contaminated excavation areas are identified as the Central, the South, and the Southwest Excavations.

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The work focuses on field activities and analytical results for the following areas:

- Contaminated soil removal of the Central, South, and Southwest Excavations;
- Hazardous waste characterization and disposal of medical/pharmaceutical waste and non-hazardous solid waste consisting of metal oil drums and cans removed from the Southwest Excavation;
- Installation and sampling of groundwater monitoring wells at four select locations around the perimeter of Building 1202; and
- Soil Vapor Intrusion assessment and soil sampling/analysis within the proposed building footprint, on the west side of Building 1202 in the vicinity of boring HCB-5.

EHSI field geologist observed soil staining, petroleum-like odor, and positive sheen in soils excavated from the Central, South, and Southwest Excavations. Groundwater was encountered within each excavation to a total depth of 6 feet below ground surface (bgs).

EHSI supervised the removal of 1,018 tons of petroleum- contaminated soils from the three excavations. Contaminated soil was hauled off-site, treated by thermal desorption process, and disposed of as class 3 soil at the CEMEX facility in Everett, Washington.

During removal of contaminated soil from the Southwest Excavation, buried 55-gallon metal drums and 5-gallon metal cans containing residual petroleum products, and numerous glass bottles and containers associated with medical/pharmaceutical laboratories were encountered. These materials were separated from the contaminated soil, characterized, transported off-site for disposal and recycling. Based on visual observations and confirmation from soil analytical testing, all three excavation areas at Federal Center South were free of diesel- to lube oil-range TPH, and VOCs contaminated soils at the completion of excavation.

Contaminants in soils and groundwater identified at the Federal Center South property included total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), including benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), and heavy metals.

Following contaminated soil removal, closure soil samples collected from the sidewalls of the Central and South Excavations and composite soil samples collected from each of the three overburden soil stockpiles associated with the excavations were analyzed for diesel- to heavy oil-range TPH. Analytical results indicate no measureable concentrations of diesel- to heavy oil-range TPH were detected above laboratory reporting limits in any of the closure or overburden stockpile samples.

Closure soil samples collected from the sidewalls of the Southwest Excavation and one composited soil sample collected from the contaminated soil stockpile were analyzed for gasoline-, diesel-, and lube oil-range TPH; VOCs; BTEX, PAHs; polychlorinated biphenyls (PCBs); and Resource Conservation & Recovery Act (RCRA) metals. Analytical results indicate the following:

- Gasoline-, Diesel-, and Lube Oil-Range TPH: No measureable concentrations of gasoline-, diesel-, or lube oil-range TPH were detected above laboratory reporting

limits in any of the nine closure sidewall samples. Gasoline, diesel, and lube oil concentrations were detected in the contaminated soil stockpile sample. However, at concentrations below the applicable Washington State Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses (173-340 WAC).

- VOCs (including BTEX): No measureable concentrations of VOCs were detected above laboratory reporting limits in any of the closure sidewall samples after the removal of contaminated soil was completed at the Southwest Excavation. Concentrations of xylenes, TCE, and six other VOCs were detected in contaminated soil removed from and stockpiled next to the Southwest Excavation (contaminated soil stockpile sample FCS-HP-01). The TCE concentration in contaminated soil stockpile sample FCS-HP-01 exceeded the MTCA Method A Soil Cleanup Level for Unrestricted Land Uses. The concentrations of xylenes and six other VOCs detected in FCS-HP-01 were below the MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses. The contaminated soil stockpile from the Southwest Excavation was subsequently removed and hauled off-site for proper disposal.
- PAHs: Naphthalene was detected in three of the nine closure soil samples and in the contaminated soil stockpile sample. One closure sample and the stockpile sample contained concentrations of six non-carcinogenic PAH compounds. None of the concentrations of naphthalene or the six non-carcinogenic PAH compounds exceeded MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses. No carcinogenic PAHs were detected.
- PCBs: No measureable concentrations of PCBs were detected in the closure sidewall samples or the contaminated soil stockpile sample FCS-HP-01.
- RCRA Metals: Concentrations of arsenic, barium, chromium, and lead were detected in the closure soil samples and the contaminated soil stockpile sample FCS-HP-01. None of the metal concentrations exceeded their applicable MTCA Method A or B Soil Cleanup Levels for Unrestricted Land Uses. No measureable concentrations of cadmium, mercury, selenium, or silver were detected soil samples collected from the Southwest Excavation.

A test pit soil sample (FCS-TP8-6.5) collected from below the water table in the vicinity of soil HCB-5 and beneath the planned building footprint, had a diesel-range TPH concentration of 4,700 mg/kg. At this concentration, the sample diesel-range TPH concentration exceeded the MTCA Method A Soil Cleanup Level of 2,000 mg/kg. Another test pit soil sample (FCS-TP8-5) collected from the same test pit within the vadose zone above the water table had a diesel-range TPH concentration that was below the MTCA Method A Soil Cleanup Level (2,000 mg/kg).

Groundwater samples collected from the four newly installed monitoring wells EHSI-MW1 through EHSI-MW4 were analyzed for gasoline-, diesel-, and lube oil-range TPH; VOCs, PAHs, and Priority Pollutants dissolved metals. Analytical results indicate the following:

- Gasoline-Range TPH: No measureable concentrations of gasoline-range TPH were detected in any of the four groundwater samples submitted for analysis.
- Diesel- and Lube Oil-Range TPH: The groundwater sample collected from well EHSI-MW2 had a diesel-range TPH concentration of 780 micrograms per liter (µg/L), which exceeded the MTCA Method A Groundwater Cleanup Level of 500 µg/L. This sample also had a lube oil-range TPH concentration of 280 µg/L, which was below the MTCA Method A Groundwater Cleanup Level of 500 µg/L. The detected diesel-range TPH concentrations in samples from wells EHSI-MW1 and EHSI-MW4 were below the regulatory cleanup level. No measurable concentrations of diesel- and lube oil-range TPH were detected above test method reporting limits in the sample collected from EHSI-MW3.
- VOCs (including BTEX): A benzene concentration of 5.1 µg/L was detected in the groundwater sample collected from EHSI-MW2. This concentration exceeded the MTCA Method A Groundwater Cleanup Level of 5.0 µg/L established for benzene in groundwater. The vinyl chloride concentrations detected in groundwater samples collected from three of the four wells ranging from 0.26 to 2.7 µg/L exceeded the MTCA Method A Groundwater Cleanup Level of 0.2 µg/L. The remaining detected VOCs in groundwater samples collected from EHSI-MW1 and EHSI-MW2 were found below their applicable regulatory cleanup levels. No measureable concentrations of VOCs were detected above test method reporting limits in the sample collected from EHSI-MW3.
- PAHs: No established regulatory cleanup levels are available for the six non-carcinogenic PAH compounds detected in groundwater samples collected from EHSI-MW1 and EHSI-MW2. Chrysene, a carcinogenic PAH compound, was detected in the groundwater sample collected from EHSI-MW1 at a concentration of 0.13 µg/L. Because none of the six remaining carcinogenic PAH compounds were detected in this sample, the concentration for total carcinogenic PAHs was calculated at 0.0013 µg/L using the toxicity equivalency factor (TEF). This total carcinogenic PAH concentration was below the MTCA Method A Groundwater Cleanup Level of 0.1 µg/L. No measureable concentrations of PAHs were detected above test method reporting limits in the sample collected from EHSI-MW3.
- Priority Pollutants Dissolved Metals: A dissolved arsenic concentration of 11.6 µg/L was detected in the groundwater sample collected from well EHSI-MW2. This concentration exceeded the MTCA Method A Groundwater Cleanup Level of 5 µg/L established for arsenic in groundwater. None of the remaining dissolved metal concentrations detected in the four groundwater samples exceeded regulatory cleanup levels.

Potential petroleum hydrocarbon contamination was identified in subsurface soil boring HCB-5, located within the footprint of the new Federal Center South building. Analyses of test pit soil samples collected from this area indicated that diesel-range petroleum hydrocarbons in excess of the MTCA Method A Cleanup Levels for Unrestricted Land Uses were present in an area that by design would be below the planned footprint of the new Federal Center South building. Soil vapor sampling was conducted on September

27, 2010, under the direction of an EHSI field geologist. Laboratory analytical results indicated that VOCs (specifically BTEX) in all three samples analyzed using U.S. Environmental Protection Agency (EPA) Test Method 8260 were below test method reporting limits for each of the individual VOCs. On the basis of the absence of potential indicator hazardous substances (IHSs) in the vadose soils located within the footprint of the new Federal Center South building, EHSI concluded that there is no likelihood that VOCs in soil vapor beneath the future Federal Center South building will cause an unacceptable risk to the future building occupants.

Based on the results and findings of the Federal Center South Interim Soil Remediation and Site Assessment, all readily identifiable and documented chemical contamination liabilities were mitigated from the three excavation areas at Federal Center South parking lot west of Building 1202. Further environmental work involving groundwater monitoring and sampling is recommended at the Federal Center South parking lot to assess for the reduction of contaminant concentrations in groundwater following source removal. Subsequent groundwater monitoring and sampling of the four newly-installed wells (i.e., EHSI-MW1 through EHSI-MW4) will be discussed in a separate report.

Federal Center South Groundwater Monitoring Assessment

A summary of the Federal Center South Groundwater Monitoring Assessment (EHSI 2010a) is presented below. A copy of the Final Report is submitted with this letter.

GSA retained EHSI to conduct a Groundwater Monitoring Assessment within the northern portion of the Federal Center South property. The Federal Center South property is located at 4735 East Marginal Way South in Seattle, Washington 98134. The Groundwater Monitoring Assessment investigated locations include:

- The federal employee's parking lot in the northeast corner of the property,
- The northern area of Building 1202 that has been recently been demolished for erection of a new office building; and
- The parking area west of Building 1202 and east of the Duwamish Waterway.

The purpose of the Federal Center South Groundwater Monitoring Assessment was to further characterize, determine the extent, and identify potential source area(s) of vinyl chloride in the property groundwater. EHSI completed an historical records review to identify past land uses and activities that may have contributed to the release of vinyl chloride and related halogenated VOCs in groundwater. The data from the historical records review was used to select locations for installing groundwater monitoring wells to assess whether groundwater contamination had migrated from identified source areas.

Based on results of the historical records review, EHSI identified seven potential on- and offsite sources associated with the use of solvents related to halogenated VOCs and its biodegradation by-products (including vinyl chloride). These seven potential contamination source areas include:

- A former garage located within the north end of Building 1201, where solvents may have been used during vehicle assembly and missile manufacturing activities;

- Building 1202 was reportedly used as a distribution depot during the 1940s where laundry and dry-cleaning supplies, including perchloroethylene (PCE), a dry-cleaning solvent were warehoused;
- Former property and vehicle maintenance shops that existed from the 1940s to the early 1970s in the northeast portion of Federal Center South property, where solvents may have been used associated with paint shops, vehicle repair/maintenance shops, and spray painting booths;
- The potential use and storage of TCE, a degreaser and cleaning solvent, in drums stored on or adjacent to a loading dock located north of and adjacent to Building 1202 during Boeing anti-aircraft missile manufacturing in the 1950s through the early 1970s;
- A tall aboveground storage tank (AST) observed in 1965 and 1970 aerial photographs located west of and adjacent to the loading dock north of Building 1202;
- A historic paint manufacturing plant operated east and across E. Marginal Way South from the Federal Center South property from the early 1920s to the early 1940s; and
- A former heavy equipment business located southeast of Federal Center South, where halogenated VOCs were detected in groundwater, but at concentrations below regulatory cleanup levels.

EHSI identified an eighth potential source area, the Southwest Contaminated Soil Excavation, where buried drums and cans previously contained residual petroleum products were discovered and removed from the Southwest Excavation during site remediation at Federal Center South in August 2010.

EHSI supervised the installation and sampling of groundwater monitoring wells EHSI-MW5 through EHSI-MW10 at six selected locations. The well siting was based on the locations of the seven identified potential source areas and the previous groundwater analytical results from samples collected from existing on-site wells.

EHSI observed no staining, odor, or other indication of contamination in soil samples retrieved during drilling of soil borings for the installation of six groundwater monitoring wells.

In November 2010, EHSI personnel collected groundwater samples from the six new monitoring wells (EHSI-MW5 through EHSI-MW10), from existing wells FC2, FC3, FC8, FC9, and from Hart Crowser (HC) installed wells HCMW-1 through HCMW-3. The groundwater samples were analyzed for VOCs, specifically vinyl chloride. The analytical results of groundwater samples collected from these 13 wells, along with the analytical results of groundwater samples collected from the eight remaining wells at Federal Center South indicate the following:

- Vinyl chloride was detected in groundwater from samples collected at 13 of the 21 monitoring wells installed at Federal Center South. All 13 vinyl chloride concentrations exceeded the MTCA Method A Cleanup Level of 0.20 micrograms

per liter (µg/L) for vinyl chloride in groundwater. Vinyl chloride in groundwater was detected in wells located along the northern portion of Federal Center South, within the vicinity of wells EHSI-MW2 and EHSI-MW8 between Buildings 1201 and 1202, and wells within the vicinity of the Southwest Excavation.

- TCE, cis 1,2-dichloroethene (cis DCE), and trans 1,2-dichloroethene (trans DCE) also were detected in groundwater samples collected from four monitoring wells (EHSI-MW1, EHSI-MW7, EHSI-MW8, and HCMW-3) that had high concentrations of vinyl chloride. TCE was detected from groundwater samples collected at wells EHSI-MW7 and HCMW-3) at concentrations exceeding the MTCA Method A Cleanup Level of 5.0 µg/L for TCE in groundwater. The presence of these three related halogenated VOCs that typically biodegrade to vinyl chloride indicate that a potential source area(s) may be nearby.

Based on the results of the historical records review, the distribution and concentration of vinyl chloride in groundwater, and the presence of related halogenated VOCs, EHSI concludes that vinyl chloride contamination in groundwater migrated from three potential source areas. These source areas include the following:

- The Loading Dock Area north of and adjacent to Building 1202. The presence of TCE and vinyl chloride at concentrations exceeding regulatory cleanup levels from samples collected at wells (HCMW-3, EHSI-MW1, and EHSI-MW7) installed within and adjacent to the loading dock indicate that a release of solvents had occurred at this location. It is likely that TCE was used as a degreaser and cleaning solvent during Boeing missile manufacturing on-site from the mid-1950s to the early 1970s. Drums were noted being stored on and adjacent to the loading dock based on 1965 and 1970 aerial photographs. Boeing reportedly stored hazardous substances in a former shed located adjacent to the loading dock.

- The Former Garage within the north end of Building 1201. Wells EHSI-MW2 and EHSI-MW8 were installed hydraulically downgradient of the former garage. The presence of vinyl chloride in groundwater detected from both wells, along with TCE and cis DCE in EHSI-MW8, and benzene in EHSI-MW2 indicate that release of solvents and petroleum products had occurred, the garage being the potential source area. The garage was present and used during Ford Motor Company vehicle assembly in the 1930s through the early 1940s, and during Boeing missile manufacturing in the mid-1950s through the early 1970s.

- The Buried Drums and Cans removed from the Southwest Contaminated Soil Excavation. Well HCMW-1 is positioned immediately adjacent to the Southwest Excavation, where buried drums and cans contained residual petroleum products were discovered and removed during site remediation at Federal Center South (August 2010). Vinyl chloride was detected in groundwater samples collected from well HCMW-1, as well as from the sample collected from the newly installed well EHSI-MW5, located approximately 35 feet north of the Southwest Excavation. TCE was detected in the stockpile of contaminated soil removed from the Southwest Excavation, indicating that TCE was released in this area, possibly from buried drums and cans found in the excavation. We belive that the

release of TCE has impacted groundwater and likely biodegraded to vinyl chloride.

Based on the results and findings of the Federal Center South, all readily identifiable and documented chemical contamination liabilities exist due to the presence of vinyl chloride and TCE at concentrations exceeding regulatory cleanup levels.

There appears to be a selective general east to west migration path for vinyl chloride in groundwater along the north portion of the Federal Center South property. The Federal Center South property is an historic estuary that was filled in to provide a shoreline. We believe that the vinyl chloride migration path is indicative of a former stream channel into the former Duwamish River.

EHSI recommends that an estimate of hydraulic conductivity be made for groundwater well FC-9 in order to ascertain the likelihood of the vinyl chloride detected in this well to migrate into the Duwamish Waterway which is located to the west and hydraulically down-gradient of the well.

Federal Center South Groundwater Flow Velocity Estimate

The shallow water bearing unit (aquifer) for the Federal Center South property is heterogeneous unit made up of imported fill (silty sand) material overlying silt estuarine deposits. The water bearing unit lies approximately six feet bgs of the surface throughout the west portion of the Federal Center South property. Intuitively, groundwater flows from the east portion of the property in a western general flow pattern following the areal gradient and perhaps some ancestral channels toward the Duwamish River.

In order to assess the potential for on-site groundwater contamination to impact surface water within the adjoining Duwamish River, a determination of potential groundwater flow of across and off-site for the site aquifer was calculated. EHSI used the following equation in order to estimate, with given assumptions, the potential flow velocity of groundwater beneath the northwest portion of the Federal Center South property.

C. W. Fetter presented the equation:

$$V_{average} = K_i/P_e$$

Where: $V_{average}$ is the average groundwater flow velocity;

K is the hydraulic conductivity;

I is the site gradient; and

P_e is the effective porosity of the aquifer material (Fetter, C.W. 2000).

As a means to empirically determine groundwater flow velocities for common unconfined aquifers. The formula is empirical because it does not account for parameters in Darcy's Law such as vertical hydraulic conductivity and assumes a linear flow through homogenous media.

Using the formula and field data (linear distances between on-site wells and distance from well FC9 to the Duwamish River, as well groundwater level measurements) we calculated the average flow velocity for the underlying aquifer of the northwest portion of the Federal Center South property.

The average estimate for water flow velocity across the site was 1.1×10^{-5} feet/day.

The estimate for water flow velocity from groundwater well FC9 to the Duwamish River was 1.1×10^{-3} feet/day.

Even if the effects of salt water intrusion and tidal influence from the Duwamish River to the site are ignored, the ability of the aquifer to deliver water to the Duwamish River is negligible.

Conclusions

GSA has remediated four large pockets of soil contamination within the north and west portions of the Federal Center South property. Vinyl chloride is present in 11 of the 20 on-site groundwater monitoring wells. Vinyl Chloride in concentrations above MTCA Method A Cleanup Levels for Groundwater exists in groundwater monitoring well FC9 that is located approximately 95 feet west of the Duwamish River. However, an estimate of groundwater flow velocity coupled with salt water intrusion and tidal influence indicates that the probability of a plume of vinyl chloride reaching the Duwamish River to be to be very low.

References

EHSI; *U.S. General Services Administration Federal Center South Interim Soil Remediation and Site Assessment Final Report*; October 19, 2010.

EHSI; *U.S. General Services Administration Federal Center South Groundwater Monitoring Assessment November 2010 Event Final Report*; December 27, 2010.

C. W. Fetter; *Applied Hydrogeology;* Prentice Hall; November 2000.

Sincerely,

Miguel A. Ortega, LG
Principal, Geologist

Enclosures